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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/568,961

02/22/2006

Mitsuyoshi Mori

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04/17/2008

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EXAMINER

PATEL, REEMA

ART UNIT

PAPER NUMBER

2812

MAIL DATE

DELIVERY MODE

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PAPER

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

<b>Office Action Summary</b>	<b>Application No.</b> 10/568,961	<b>Applicant(s)</b> MORI ET AL.	
	<b>Examiner</b> Reema Patel	<b>Art Unit</b> 2812	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 04 January 2008.
- 2a) ☒ This action is **FINAL**.                      2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 63-70 and 72-86 is/are pending in the application.
- 4a) Of the above claim(s) 63-69, 72-76, 78-80, 82 and 84-86 is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 70, 77, 81 and 83 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 22 February 2006 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All    b) ☐ Some \*    c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- |   |   |
|---|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)   | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)  | 5) <input type="checkbox"/> Notice of Informal Patent Application                       |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)<br>Paper No(s)/Mail Date <u>1/4/08</u> . | 6) <input type="checkbox"/> Other: _____  |

## **DETAILED ACTION**

This office action is in response to an amendment filed 1/4/08.

### ***Information Disclosure Statement***

1. The information disclosure statement (IDS) was submitted on 1/4/08. The submission is in compliance with the provisions of 37 CFR 1.97. Accordingly, the information disclosure statement has been considered by the examiner.

### ***Claim Rejections - 35 USC § 103***

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

3. Claims 70, 77, and 83 are rejected under 35 U.S.C. 103(a) as being unpatentable over Inoue et al. (U.S. 2003/0127667 A1; hereinafter 'Inoue') in view of Sumino et al. (U.S. 2003/0030089 A1; hereinafter 'Sumino').

4. Regarding claims 70, 77, and 83, Inoue discloses a solid state imaging device, for use in a camera device ([0002]), in which a plurality of unit pixels are arranged on a substrate, each unit pixel including a plurality of element formation regions (32, Fig. 1) and element isolation regions (36, Fig. 1) between the element formation regions ([0007]-[0008]). Inoue discloses that the element isolation regions comprise of trenches ([0007]) but does not disclose the specific steps (a)-(e) in forming the trench isolation regions and hence does not disclose forming the

photoelectric conversion section and an active region in the element formation regions after the step (e) in a step (f).

5. However, Sumino discloses forming a trench by the following steps:

- A step (a) of forming, on the semiconductor substrate, a protection film including an opening portion that exposes the element isolation formation region and a region located beside the element isolation formation region of the semiconductor substrate ([0042]; Fig. 1A);
- A step (b) of forming a sidewall on a side face of the opening in the protection film ([0043]; Fig. 1C);
- A step (c) of forming a trench in the element isolation formation region in the semiconductor substrate by etching using the protection film and the sidewall as a mask, wherein the width of the trench is made smaller by the thickness of the sidewall than the width of the opening in the protection film ([0043]; Fig. 1D);
- A step (d) of oxidizing a side face portion of the trench in the semiconductor substrate by using the protection film and the sidewall as a mask after the step (c) ([0044]; Fig. 1E);
- A step (e) of forming an element isolation region by burying the trench with a burying film after the step (d) ([0045]; Fig. 1F);

6. The advantage of forming the trench by the method of Sumino is that the trench forms with a non-rectangular sidewall and bottom surface and can hence allow for a steeper trench ([0004]-[0005]). Therefore, it would have been obvious to one having

ordinary skill in the art at the time the invention was made to modify Inoue with forming the trench regions according to the steps as taught by Sumino so as to form steeper trench isolation regions.

7. Regarding a step (f) of forming a photoelectric conversion section and an active region in the element formation regions after the step (e), Inoue discloses forming a photoelectric conversion section and an active region in the element formation regions ([0008]) but does not specifically disclose that it is after a step (e). However, it would have been obvious to one of ordinary skill in the art at the time of the invention to form the photoelectric conversion section and an active region in the element formation regions after forming an element isolation region because selection of any order of performing process steps is *prima facie* obvious in the absence of new or unexpected results. *In re Burhans* 154 F.2d 690, 69 USPQ 330 (CCPA 1946).

8. Regarding the limitation in independent claims 70 and 77 of, “in the step (f), due to the width of the trench narrower than...”, the applicant should note that this is merely result language, and does not add any appreciable weight to the claim. Furthermore, since the prior art references in combination recites the same method as in the applicant’s claim, the references are seen by the examiner as having the same results.

9. Claim 81 is rejected under 35 U.S.C. 103(a) as being unpatentable over Inoue et al. (U.S. 2003/0127667 A1; hereinafter ‘Inoue’) and Sumino et al. (U.S. 2003/0030089 A1; hereinafter ‘Sumino’) as applied to claim 70 above, and further in view of Gardner et al. (U.S. 6,433,400 B1; hereinafter ‘Gardner’).

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10. Regarding claim 81, Inoue and Sumino disclose the method steps of claim 70 and that the photoelectric conversion section and the active region include an n-type impurity (Inoue: [0008]) but do not disclose implanting a p-type into a-side face portion of the trench in the semiconductor substrate. However, Gardner discloses implanting a p-type into a side face portion of the trench in the semiconductor substrate by using the protection film and the sidewall as a mask after the step of forming a trench and before the step of oxidizing the lateral sides of the trench (col 5, lines 42-52; Fig. 5-8). The motivation of performing this step is to create a channel stop, which decreases the effective width of the active areas. Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify Inoue and Sumino with implanting a p-type impurity, as taught by Gardner, so as to create a channel stop layer.

### ***Response to Arguments***

11. Applicant's arguments with respect to claims 70, 77, 81, and 83 have been considered but are moot in view of the new ground(s) of rejection.

### ***Conclusion***

12. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within

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TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Reema Patel whose telephone number is (571)270-1436. The examiner can normally be reached on M-F, 8:00-4:30 ET.

If attempts to reach the examiner by telephone are unsuccessful, please contact the examiner's acting supervisors, Walter Lindsay, Jr. (571)272-1674 or Scott Geyer (571)272-1958. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Reema Patel/  
Examiner, Art Unit 2812

/Scott B. Geyer/  
Acting SPE of Art Unit 2812